

NAVSHIPS 0967-163-9020

(Non-Registered)

VOLUME 2

TECHNICAL MANUAL

for

RADIO SET  
AN/SRC-23(V)

CHAPTER A, SECTION 3  
OPERATION

DEPARTMENT OF THE NAVY  
NAVAL SHIP SYSTEMS COMMAND





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TECHNICAL MANUAL

IN

RADIO SET

ANALOG (A)

CHAPTER 1. GENERAL

SECTION 1. INTRODUCTION

DEPARTMENT OF THE NAVY

NAVY AIR FORCE

OFFICE OF THE SECRETARY

NAVY DEPARTMENT

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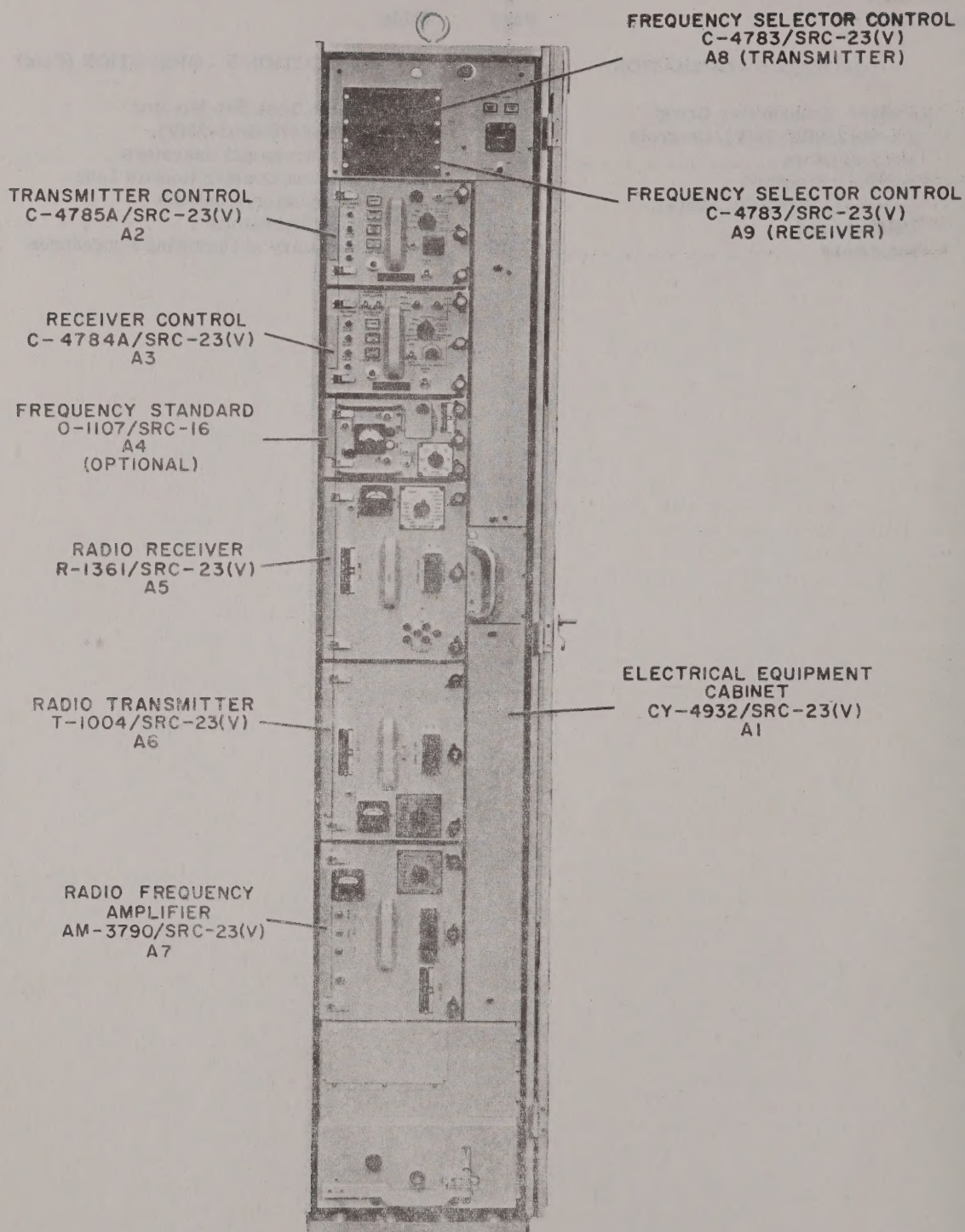


Figure 3-1. Receiver-Transmitter Group OA-8012/SRC-23(V), Location of Units



## SECTION 3

## OPERATION

## 3-1. FUNCTIONAL OPERATION.

Radio Set AN/SRC-23(V) is a single channel receiver-transmitter which provides hf radio communication in the 2.0000- to 29.9999-mc frequency range. The automatically tuned receiver-transmitter group is capable of simplex or duplex operation in the CW, fsk, data, or voice modes. In the data or voice modes, USB, LSB, or ISB (both USB and LSB) can be selected. The CW and fsk modes are exclusively USB operation. For local handset voice communications, USB, LSB, or compatible AM (USB plus carrier) can be selected.

a. RECEIVER-TRANSMITTER GROUP OA-8012/SRC-23(V). - The single channel receiver-transmitter has an rf power output capability of 1000 watts pep. (peak envelope power) with two or more tones, or 500 watts continuous average power. Provisions are made for operation with an optional power amplifier which provides 5000 watts pep., or 2500 watts continuous average rf output power. The optional Radio Frequency Amplifier AM-3799/SRC-23(V) is not supplied as part of Radio Set AN/SRC-23(V).

The receiver-transmitter is automatically tuned through the 2.0000- to 29.9999-mc operating range in 280,000 channels, spaced 100 cps apart. The receiver is equipped with a bfo which enables continuous tuning between channels in all modes except data.

Similar control functions are provided by both the local and remote transmitter and receiver controls. The individual transmitter and receiver frequency selector controls are identical at both local and remote locations. The local frequency selector controls are installed at the top of the electrical equipment cabinet. The remote frequency selector controls are part of their respective remote transmitter control or remote receiver control. The operational and alarm indicators on the local and remote controls are in parallel and provide simultaneous indications. However, the operating controls on the remote transmitter control or remote receiver control are only enabled when the mode select switch on the related local control is set to REMOTE. Similarly, when a mode select switch is set to REMOTE, the remaining controls on the local control are disabled, and all operational control functions are transferred to the related remote control.

b. FREQUENCY STANDARD GROUP OA-4792/SRC-23(V). - The frequency standard group may be

supplied as part of the Radio Set AN/SRC-23(V) depending upon individual installation requirements. The frequency standard group contains three frequency standards and a signal comparator located in a single cabinet. The outputs of the three frequency standards are routed to the signal comparator where they can be compared with each other or with an external 100-kc frequency standard. The most stable frequency standard can then be selected as the primary frequency standard for the complete systems.

At some installations, a frequency standard is supplied as part of the receiver-transmitter group and is installed in the electrical equipment cabinet as unit A4. Other installations may operate with an external 100-kc frequency standard and will not include the frequency standard group or individual frequency standard units.

c. RADIO TEST SET - MONITOR TS-2476/SRC-23(V). - The radio test set-monitor provides two selectable, level-controlled audio tone outputs which are used to perform system level checks, measure transmitter and receiver distortion, and test receiver-transmitter frequency lock. The audio tones are applied to the transmitter audio inputs. During distortion and frequency lock tests, a portion of the transmitted signal is fed back through the receiver. The received audio output tones are applied to distortion analyzer circuits in the radio test set-monitor during distortion tests. During frequency lock tests, the single tones on each sideband are applied to opposite deflection plates of the radio test set-monitor oscilloscope. The oscilloscope is also used to test fsk performance.

## 3-2. DESCRIPTION OF OPERATING CONTROLS AND INDICATORS.

The functions of controls and indicators on units which provide local or remote control of Receiver-Transmitter Group OA-8012/SRC-23(V) are listed in table 3-1. Functions of operating controls and indicators located on units which are part of Frequency Standard Group OA-4792/SRC-23(V) are listed in table 3-2. Functions of Radio Test Set-Monitor TS-2476/SRC-23(V) operating controls and indicators are listed in table 3-3. Figure 3-1 shows the location of units which are part of Receiver-Transmitter OA-8012/SRC-23(V). Figures 3-2 through 3-13 show control and indicator locations.



TABLE 3-1. RECEIVER-TRANSMITTER GROUP OA-8012/SRC-23(V), CONTROLS AND INDICATORS

CONTROL OR INDICATOR	REFERENCE DESIGNATION	FUNCTION
ELECTRICAL EQUIPMENT CABINET CY-4932/SRC-23(V), UNIT A1 (figure 3-2)		
POWER ON-OFF circuit breaker	CB1	Applies 115-volt, 3-phase, 400-cps primary power to cabinet, and protects primary power source against overload.
TEMP ALARMS		
WARNING indicator	DS1A	Lights when internal temperature exceeds 57°C (135°F).
UNSAFE indicator	DS1B	Lights when radio receiver, radio transmitter, or rf amplifier alarm circuit operates.
WARNING/UNSAFE pushbutton	S1	Deenergizes horn when pressed.
Horn	DS3	Emits audible alarm when internal temperature exceeds 57°C (135°F).
BATTLE SHORT pushbutton indicator	S2 and DS2	Lights to indicate battle short operation is in effect.
CAUTION		
Equipment will operate under unsafe conditions when BATTLE SHORT pushbutton is pressed.		
ALARM TEST pushbutton	S3	Tests all TEMP ALARM indicator lamps and audible alarm horn.
ELAPSED TIME indicator	M1	Indicates total time primary power has been applied to electrical equipment cabinet.
TRANSMITTER CONTROL C-4785A/SRC-23(V), UNIT A2 (figure 3-3)		
PWR ON-OFF circuit breaker	CB1	Applies 115-volt, 400-cps, 3-phase power when ON. Magnetically trips to OFF if total current exceeds one ampere.
Mode select switch	S1	Seven-position rotary switch.
REMOTE position		Transfers operational control to remote transmitter control.
CW position		Selects local-controlled CW operation.
FSK position		Selects local-controlled fsk operation.
DATA position		Enables local-controlled data transmission.



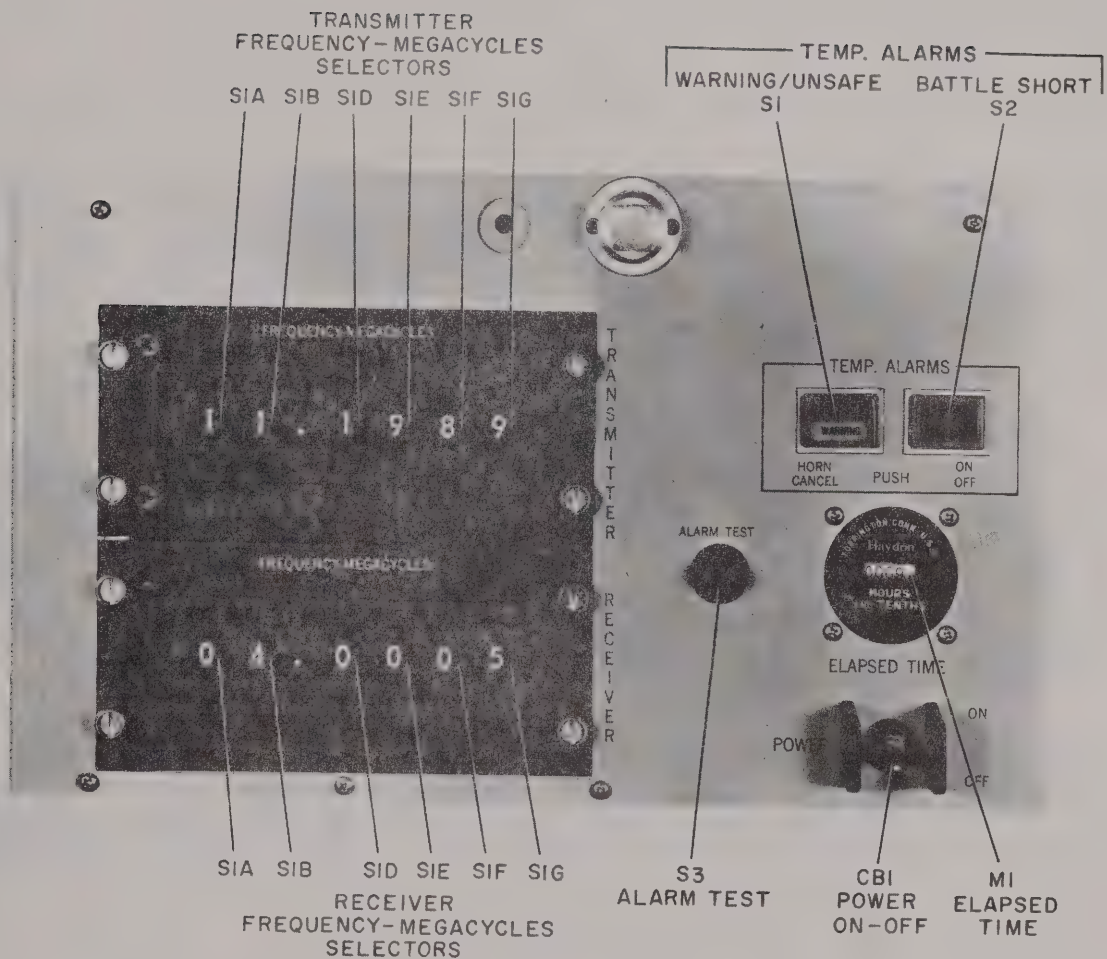


Figure 3-2. Electrical Equipment Cabinet CY-4932/SRC-23(V), Unit A1, and Frequency Selector Controls C-4783/SRC-23(V), Units A8 and A9, Controls and Indicators

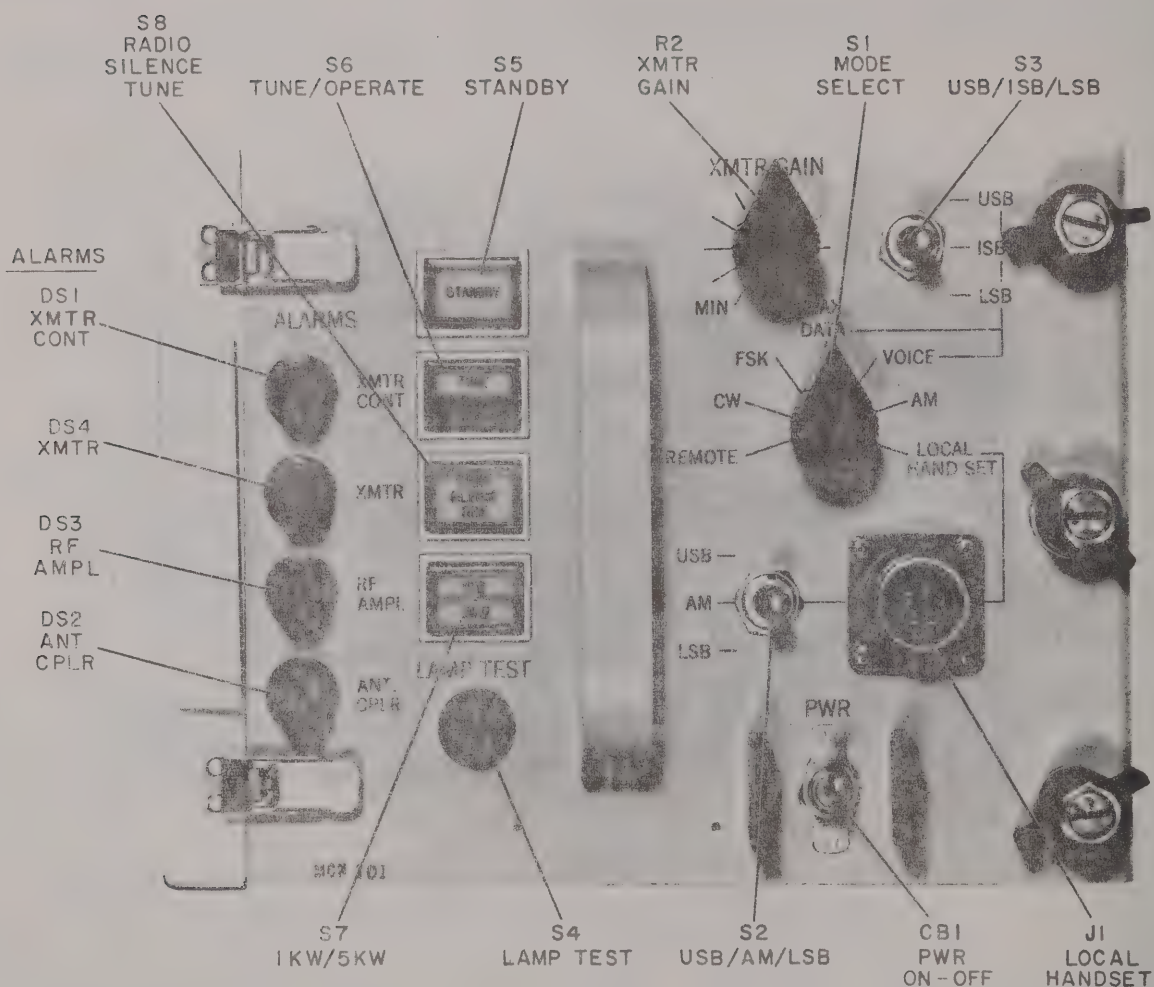


Figure 3-3. Transmitter Control C-4785A/SRC-23(V), Unit A2, Controls and Indicators



TABLE 3-1. (Continued)

CONTROL OR INDICATOR	REFERENCE DESIGNATION	FUNCTION
TRANSMITTER CONTROL C-4785A/SRC-23(V), UNIT A2 (figure 3-3) (Cont)		
VOICE position		Enables local-controlled voice transmission.
AM position		Enables local-controlled AM (USB plus carrier) transmission.
LOCAL HANDSET position		Enables local handset transmission and reception.
USB/AM/LSB select switch	S2	Selects USB, AM, or LSB emission for local handset operation. Not used for other modes.
USB/ISB/LSB select switch	S3	Selects LSB, ISB or USB emission for local controlled data or voice modes of operation. Not used for other modes of operation.
STANDBY pushbutton switch	S5	Returns transmitter to standby condition when pressed. When transmitter is in standby, pushbutton is illuminated.
TUNE/OPERATE pushbutton switch	S6	Initiates transmitter tune cycle when pressed. During tuning, TUNE portion of pushbutton lights. OPERATE portion of pushbutton lights upon completion of tune cycle.
1KW/5KW pushbutton		Press to select 1-kw transmission using rf amplifier unit A7, or 5-kw transmission using optional rf amplifier. 1KW or 5KW portions of pushbutton are illuminated to indicate selection.
RADIO SILENCE TUNE pushbutton	S8	Illuminated pushbutton switch tunes transmitter with 50-ohm load connected at rf output of associated antenna coupler. OPERATE portion of TUNE/OPERATE pushbutton lights upon completion of tune cycle. Tunes receiver antenna coupler in duplex mode of operation.
LAMP TEST switch	S4	Applies dc ground return to all indicator lamps to test bulbs.
FSK POLARITY	S9	On NORM, fsk mark tone is 2425 cps, space tone is 1575 cps. When switch is set to INV, mark and space tones are interchanged.
ALARMS		
XMTR alarm	DS4	Indicates fault in radio transmitter.
RF AMPL alarm	DS3	Indicates fault in rf amplifier.
ANT. CPLR alarm	DS2	Indicates fault in associated antenna coupler.
XMTR CONT alarm	DS1	Indicates fault in transmitter control.

TABLE 3-1. (Continued)

CONTROL OR INDICATOR	REFERENCE DESIGNATION	FUNCTION
TRANSMITTER CONTROL C-4785A/SRC-23(V), UNIT A2 (figure 3-3) (Cont)		
XMTR CONT alarm (Cont)		Note
		Transmitter reverts to STANDBY condition if a fault is indicated in the radio transmitter, rf amplifier, or antenna coupler.
XMTR GAIN control	R2	Reduces rf amplifier output level for transmission to nearby receivers.
RECEIVER CONTROL C-4784A/SRC-23(V), UNIT A3 (figure 3-4)		
PWR ON-OFF circuit breaker	CB1	Applies 115-volt, 400-cps 3-phase power to receiver control when ON. Magnetically tripped OFF if current exceeds 0.75 ampere.
Mode select switch	S1	Seven-position rotary switch.
REMOTE position		Switches all operational control functions to remote receiver control.
CW position		Disables USB squelch network for CW reception.
FSK position		Disables USB squelch network for fsk reception.
DATA position		Disables both USB and LSB squelch networks for data mode reception. Also disables rf-bfo oscillator.
VOICE position		Enables USB, LSB, or normal voice reception.
AM position		Enables AM reception.
DOPPLER TEST position		Disables USB and LSB squelch circuits, and enables duplex operation for doppler test purposes.
USB/ISB/LSB select switch	S3	Selects USB, LSB or ISB (both USB and LSB) for data or voice reception. Not used for other modes.
FINE TUNE-CPS controls		
ON-OFF switch	S2	ON position enables rf-bfo oscillator unless DATA or AM mode is selected. OFF position disables rf-bfo oscillator for all modes.
FINE TUNE-CPS adjust	R1	Adjusts bfo frequency $\pm 60$ cps from nominal 500 kc at midpoint. Allows continuous receiver tuning between 0.1-kc increments.
RCVR GAIN switch	S10	
LOCAL position		In simplex, receiver overload protector reduces receiver rf input 40 db. In duplex, bandpass filter low gain circuits are energized.





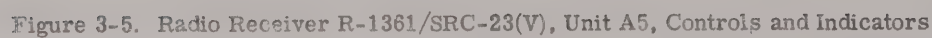
TABLE 3-1. (Continued)

CONTROL OR INDICATOR	REFERENCE DESIGNATION	FUNCTION
RECEIVER CONTROL C-4784A/SRC-23(V), UNIT A3 (figure 3-4) (Cont)		
NORMAL position		Radio receiver operates with normal gain.
MAX position		Sets radio receiver rf tuner bias for maximum rf gain.
SQUELCH switches		
LSB ON-OFF switch	S8	Enables (ON) LSB squelch network.
USB ON-OFF switch	S9	Enables (ON) USB squelch network.
STANDBY pushbutton	S5	Returns radio receiver to standby condition when pressed. When receiver is in standby, indicator is illuminated.
TUNE/OPERATE pushbutton	S6	Initiates radio receiver and bandpass filter tune cycles when pressed. During tuning, TUNE portion of pushbutton lights. OPERATE portion of pushbutton lights upon completion of tune cycle.
SIMPLEX/DUPLEX pushbutton	S7	Selects simplex or duplex operation. Corresponding portions of pushbutton light to indicate selected type of operation.
ALARMS indicators		
RCVR CONT indicator	DS1	Lights if internal +28 volts dc is interrupted.
RCVR indicator	DS3	Lights if radio receiver fault occurs.
RCVR OVLD indicator	DS2	Lights if rf overload occurs during simplex operation. Controlled by receiver overload protection circuit.
ANT. CPLR indicator	DS4	Lights if rf overload occurs during duplex operation. Controlled by bandpass filter protection circuits.
LAMP TEST switch	S4	Applies dc ground return to all indicator lamps to test bulbs.
FREQUENCY STANDARD O-1107/SRC-16, UNIT A4 (figure 3-1).		
<p>Note</p> <p>Frequency standard may be supplied as part of Frequency Standard Group OA-4792/SRC-23(V). Refer to table 3-2.</p>		



TABLE 3-1. (Continued)

CONTROL OR INDICATOR	REFERENCE DESIGNATION	FUNCTION
RADIO RECEIVER R-1361/SRC-23(V), UNIT A5 (figure 3-5)		
PRIMARY POWER AC CIRCUIT BREAKERS	CB1A, CB1B, CB1C	Apply 115-volt, 3-phase, 400-cps power to radio receiver in ON. Protect cabinet against radio receiver overload.
Test meter	M1	Meters functions selected by TEST SELECTOR.
TEST SELECTOR	S2	Selects test meter functions for operator's maintenance on radio receiver.
PUSH TO TEST pushbutton	S1	Enables test meter.
RADIO TRANSMITTER T-1004/SRC-23(V), UNIT A6 (figure 3-6)		
PRIMARY POWER AC CIRCUIT BREAKERS	CB1A, CB1B, CB1C	Apply 115-volt, 400-cps, 3-phase power to radio transmitter. Protect source against radio transmitter overload.
Test meter	M1	Meters functions selected by TEST SELECTOR.
TEST SELECTOR	S1	Selector test meter functions for operator's maintenance on radio transmitter.
PUSH TO TEST pushbutton	S2	Enables test meter.
RADIO FREQUENCY AMPLIFIER AM-3790/SRC-23(V), UNIT A7 (figure 3-7)		
PRI POWER CIRCUIT BREAKERS	CB1A, CB1B, CB1C	Apply 115-volt, 400-cps, 3-phase power to rf amplifier. Protect source against rf amplifier overload.
CONT CKTS CIRCUIT BREAKERS	CB2	Applies 115-volt, 400-cps, single phase to rf amplifier control circuits.
Test meter	M1	Meters functions selected by TEST SELECTOR.
TEST SELECTOR	S3	Selects test meter functions for operator's maintenance on rf amplifier.
PUSH TO TEST METER pushbutton	S2	Enables test meter.
SERVO pushbutton	S4	Provides servo test input.
HV RESET pushbutton	S1	Resets rf amplifier high voltage circuits after overload.
Elapsed time meter	M2	Indicates total time rf amplifier filaments are on.







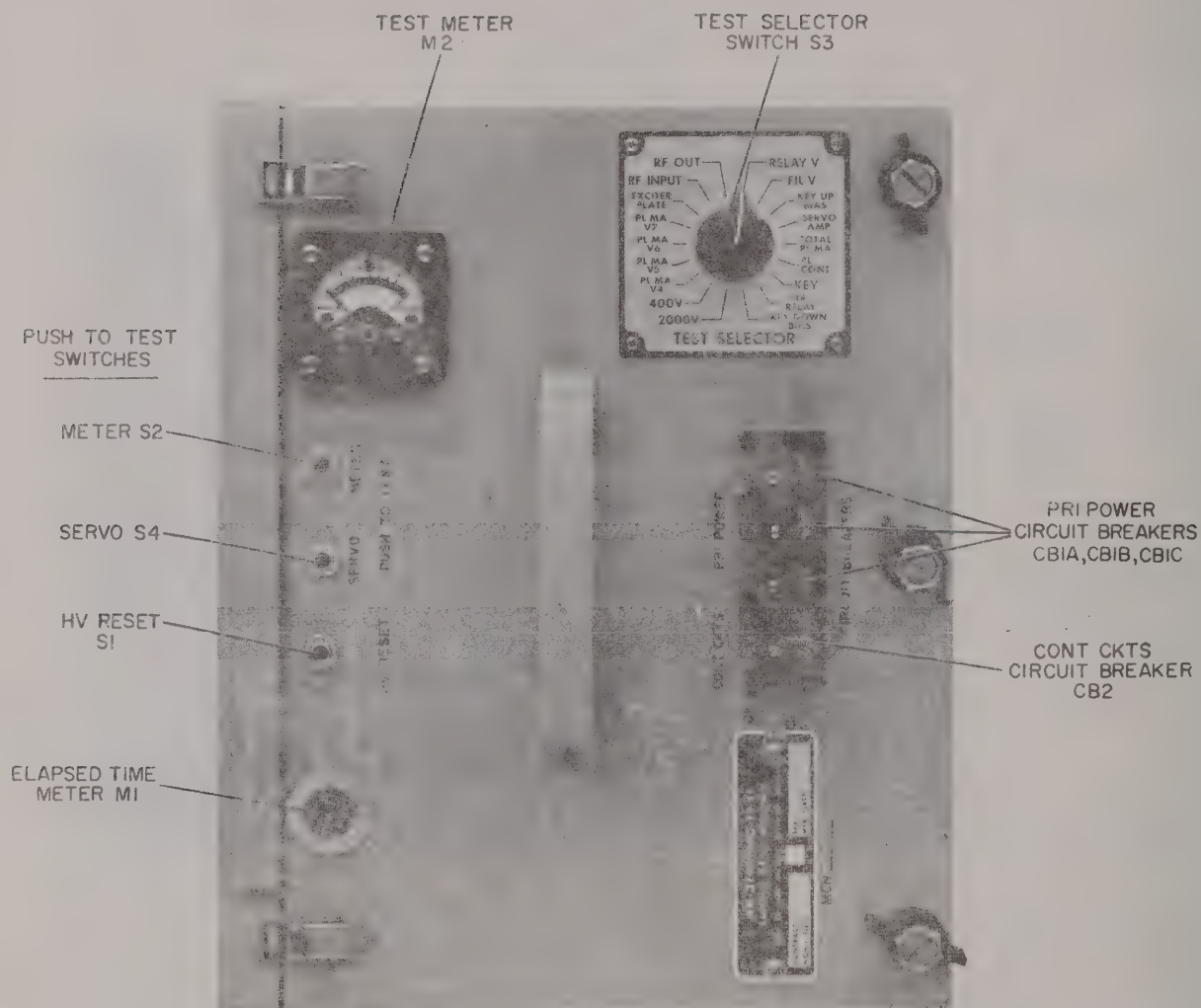


Figure 3-7. Radio Frequency Amplifier AM-3790/SRC-23(V) Unit A7, Controls and Indicators



TABLE 3-1. (Continued)

CONTROL OR INDICATOR	REFERENCE DESIGNATION	FUNCTION
FREQUENCY SELECTOR CONTROLS C-4783/SRC-23(V), UNITS A8 AND A9 (figure 3-2)		
FREQUENCY-MEGACYCLES selectors	S1A, S1B, S1D through S1G	Select corresponding digits of radio transmitter or radio receiver frequency, from 2.0000 mc to 29.9999 mc.
TRANSMITTER CONTROL-INDICATOR C-6704/SRC-23(V) (figure 3-8)		
CONTROL indicator	DS5	Indicates remote transmitter control is in control of radio transmitter. Indicator lights when local transmitter control mode select switch is on REMOTE.
STANDBY pushbutton	S1	Momentary pushbutton places transmitter in standby condition. Indicator lamp lights in standby condition.
TUNE/OPERATE pushbutton	S2	Momentary pushbutton with independent TUNE and OPERATE indicators. Initiates transmitter tune cycle when pressed. TUNE indicator lights during tuning. OPERATE indicator lights upon completion of tuning.
RADIO SILENCE TUNE pushbutton	S3	Tunes transmitter with 50-ohm resistive load at output of associated antenna coupler. Indicator lights during tuning. OPERATE indicator lights upon completion of tuning. Used for remote duplex receiver antenna coupler tuning.
1KW/5KW pushbutton	S6	Two-state pushbutton switch. Selects rf amplifier unit A7 when 1KW is selected. Selects optional 5-kw rf amplifier when 5KW is selected.
Mode select switch	S4	Five-position rotary switch.
CW position		Selects CW mode of operation.
FSK position		Selects fsk mode of operation.
DATA position		Selects data mode of operation.
VOICE position		Selects voice mode of operation.
AM position		Selects AM (USB plus carrier) operation.
USB/ISB/LSB switch	S5	Selects USB, LSB or ISB (both LSB and USB) for data or voice modes only.
LAMP TEST switch	S7	Tests all front panel indicator lamps.
ALARMS indicators		
XMTR CONT	DS1	Indicates fault in local transmitter control +28 volt dc supply.

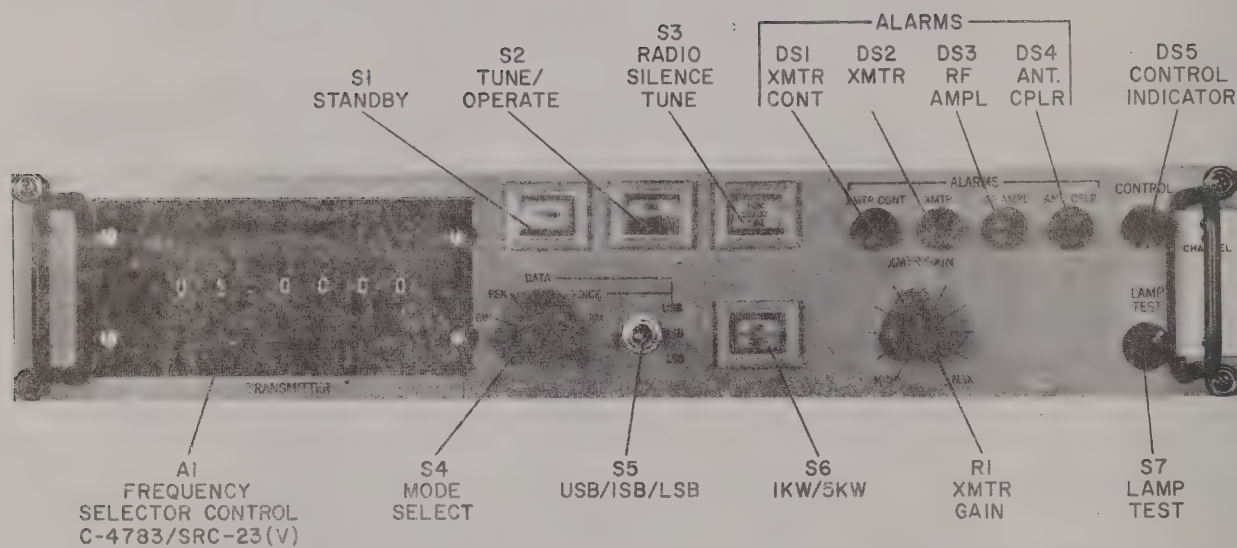


Figure 3-8. Transmitter Control-Indicator C-6704/SRC-23(V), Controls and Indicators



TABLE 3-1. (Continued)

CONTROL OR INDICATOR	REFERENCE DESIGNATION	FUNCTION
TRANSMITTER CONTROL-INDICATOR C-7704/SRC-23(V) (figure 3-8) (Cont)		
XMTR	DS2	Indicates fault in radio transmitter.
RF AMPL	DS3	Indicates fault in rf amplifier.
ANT. CPLR	DS4	Indicates fault in associated antenna coupler.
XMTR GAIN control	R1	Reduces rf output level for transmissions to nearby receivers.
FREQUENCY-MEGACYCLES selectors	A1S1A	Selects X0.0-mc transmitter frequency digit (0, 1 or 2).
	A1S1B	Selects 0X.0-mc transmitter frequency digit (0 thru 9).
	A1S1D	Selects 00.X-mc transmitter frequency digit (0 thru 9).
	A1S1E	Selects 0.0X-mc transmitter frequency digit (0 thru 9).
	A1S1F	Selects 0.00X-mc transmitter frequency digit (0 thru 9).
	A1S1G	Selects 0.000X-mc transmitter frequency digit (0 thru 9).
RECEIVER CONTROL-INDICATOR C-6705/SRC-23(V) (figure 3-9)		
CONTROL indicator	DS5	Indicates remote receiver control is in control of radio receiver. Indicator lights when local receiver control mode select switch is on REMOTE.
STANDBY pushbutton	S1	Momentary pushbutton places receiver in standby condition. Indicator lights in standby condition.
TUNE/OPERATE pushbutton	S2	Momentary pushbutton with independent TUNE and OPERATE indicators. Initiates receiver tune cycle when pressed. TUNE indicator lights during tuning. OPERATE indicator lights upon completion of tuning.
SIMPLEX/DUPLEX pushbutton	S3	Two-condition pushbutton with independent indicators. Selects simplex or duplex operation.
Mode select switch	S4	Five-position rotary switch.
CW position		Selects remote-controlled CW mode.
FSK position		Selects remote-controlled fsk mode.
DATA position		Selects remote-controlled data mode.
VOICE position		Selects remote-controlled voice mode.
AM position		Selects remote AM (USB plus carrier) mode of operation.

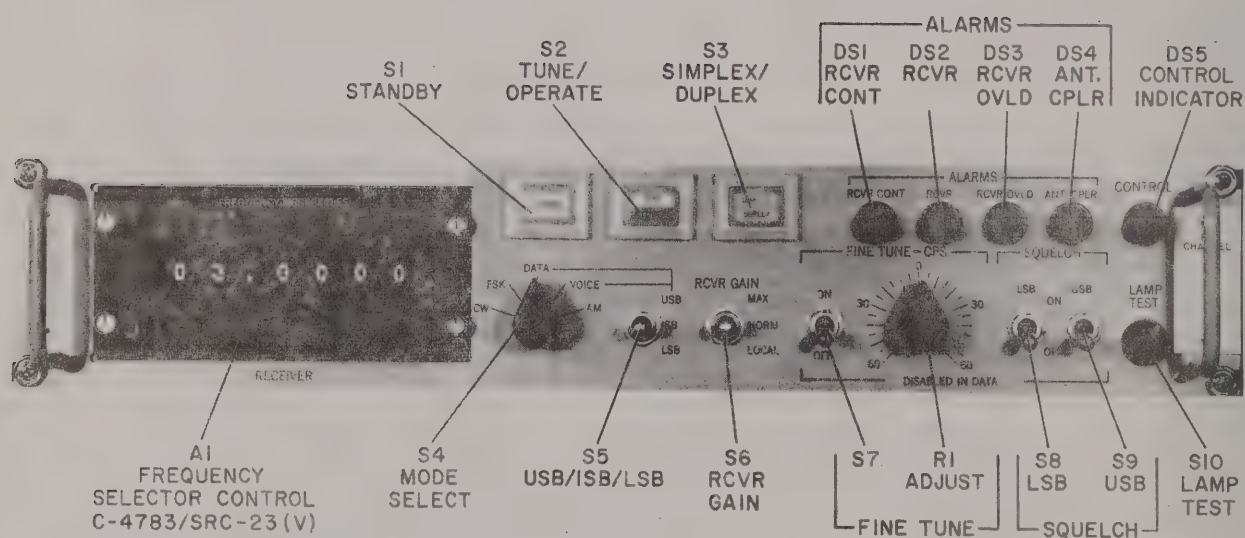


Figure 3-9. Receiver Control-Indicator C-6705/SRC-23(V), Controls and Indicators



TABLE 3-1. (Continued)

CONTROL OR INDICATOR	REFERENCE DESIGNATION	FUNCTION
RECEIVER CONTROL-INDICATOR C-6705/SRC-23(V) (figure 3-9) (Cont)		
USB/ISB/LSB switch	S5	Selects LSB, USB, or ISB (both LSB and USB) for voice or data operation only.
RCVR GAIN switch	S6	Selects maximum radio receiver gain on MAX or minimum gain on LOCAL or normal receiver gain on NORM.
FINE TUNE-CPS	S7	Enables local receiver control rf-bfo when set to ON.
ON-OFF		
Adjust	R1	Adjusts bfo frequency $\pm 60$ cps from nominal 500-kc at midpoint setting.
SQUELCH switches		
LSB ON-OFF	S8	Enables local receiver control LSB squelch network.
USB ON-OFF	S9	Enables local receiver control USB squelch network. When ON, squelch network assemblies quiet audio outputs except when received audio is present.
LAMP TEST pushbutton	S10	Tests all front panel indicator lamps.
ALARMS indicators		
RCVR CONT alarm	DS1	Indicates fault in local receiver control +28-volt dc supply.
RCVR alarm	DS2	Indicates fault in radio receiver.
RCVR OVLD alarm	DS3	Indicates receiver rf overload. Indication provided by local receiver control rf overload protector during SIMPLEX or by optional receiver bandpass filter during DUPLEX.
ANT. CPLR	DS4	Indicates fault in associated antenna coupler.
FREQUENCY-MEGACYCLES selectors	A1S1A	Selects X0.0-mc receiver frequency digit (0, 1, or 2).
	A1S1B	Selects 0X.0-mc receiver frequency digit (0 thru 9).
	A1S1D	Selects 0.X0-mc receiver frequency digit (0 thru 9).
	A1S1E	Selects 0.0X-mc receiver frequency digit (0 thru 9).
	A1S1F	Selects 0.00X-mc receiver frequency digit (0 thru 9).
	A1S1G	Selects 0.000X-mc receiver frequency digit (0 thru 9).

TABLE 3-1. (Continued)

CONTROL OR INDICATOR	REFERENCE DESIGNATION	FUNCTION
AF-RF MONITOR ID-1370/SRC-23(V) (figure 3-10)		
AF meter	M1	Audio VU meter.
AUDIO selector switch	S1	Selects AF meter indications of USB or LSB transmit audio inputs or receive audio outputs.
SENSITIVITY select	S2	Selects range of AF meter.
RF meter	M2	Indicates forward or reflected rf power levels.
RF POWER selector switch	S3	Selects forward or reflected rf power indications of either 1-kw or 5-kw rf amplifier.

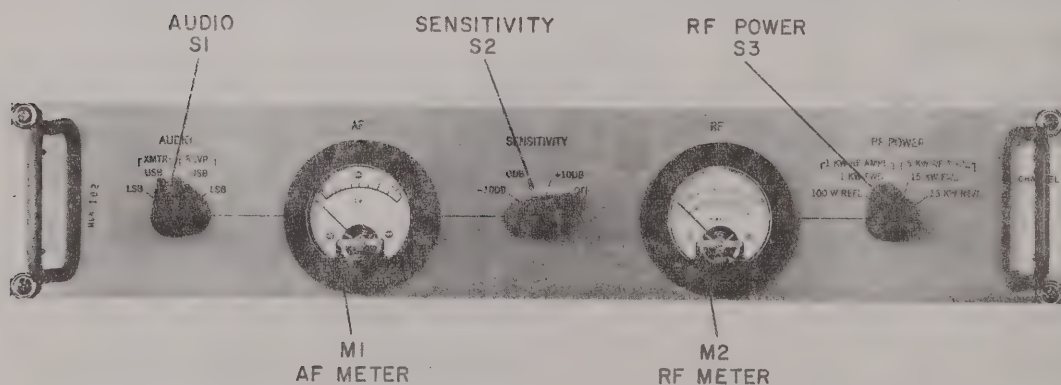


Figure 3-10. AF-RF Monitor ID-1370/SRC-23(V), Controls and Indicators



TABLE 3-2. FREQUENCY STANDARD GROUP OA-4792/SRC-23(V), CONTROLS AND INDICATORS

CONTROL OR INDICATOR	REFERENCE DESIGNATION	FUNCTION
SIGNAL COMPARATOR CM-270/SRC-16, UNIT A1 (figure 3-11)		
PRIMARY AC POWER CKT BKR	CB1, CB2	Apply 115-volt, 400-cps, single-phase power to signal comparator. Protect primary power source against overload.
FREQUENCY STANDARD COMPARISON SWITCH NO. 1	S1	Selects one of four frequency sources for comparison with frequency source selected by FREQUENCY STANDARD COMPARISON SWITCH NO. 2
FREQUENCY STANDARD COMPARISON SWITCH NO. 1	S2	Selects frequency standard to be compared with the standard selected by FREQUENCY STANDARD COMPARISON SWITCH NO. 1.
STANDARD SELECTOR SWITCH	S3	Selects frequency standard to be used as the system standard.
Comparison meter	M1	Indicates frequency difference of inputs selected by FREQUENCY STANDARD COMPARISON SWITCH NO. 1 and FREQUENCY STANDARD COMPARISON SWITCH NO. 2.
EXTERNAL STANDARD INPUT jack	J4	Allows an external frequency standard to be compared with any one of the three internal frequency standards.
EMERGENCY OPERATE indicator	DS1	Indicates when primary rf isolation amplifier is not providing an output; secondary rf isolation amplifier provides backup.
FREQUENCY STANDARD O-1107/SRC-16, UNITS A2, A3, AND A4 (figure 3-11)		
AC LINE circuit breakers	CB1, CB2	Apply 115-volt, 400-cps single-phase power to frequency standard. Protect primary power source against overload.
BATTERY circuit breaker	CB3	Protects internal or external standby battery against overload.
AC indicator	DS3	Indicates ac power is applied to frequency standard.
BAT indicator	DS2	Indicates frequency standard is operating on battery if AC indicator is not lighted.
Test meter	M1	Meters functions selected by METER FULL SCALE selector.
METER FULL SCALE selector	S2	Eight-position test selector.
BAT 30V		Connects test meter across +28-volt dc supply or battery.

TABLE 3-2. (Continued)

CONTROL OR INDICATOR	REFERENCE DESIGNATION	FUNCTION
FREQUENCY STANDARD O-1107/SRC-16, UNITS A2, A3, AND A4 (figure 3-11) (Cont)		
REG 30V		Connects test meter across +15-volt dc supply.
OVEN 30V		Connects test meter across crystal oven supply.
AGC 3 MA		Connects test meter across crystal oscillator agc.
5 MC 3V		Connects test meter across 5-mc oscillator output.
1 MC 3V		Connects test meter across 1-mc divider output.
100 KC 3V		Connects test meter across 100-kc divider output.
Unmarked position		Disconnects test meter.
DIVIDER- PUSH TO START		
1 MC pushbutton	S3	Restores 1-mc divider operation after interruption.
100 KC pushbutton	S4	Restores 100-kc divider operation after interruption.
FREQUENCY ADJUST PARTS IN $10^{10}$	L1	Compensates for crystal aging. Each graduation on associated dial results in a change of 1 part in $10^{10}$ (0.00001 cps at 100 kc).
Frequency adjustment lock	C3	Locks the FREQUENCY ADJUST control.

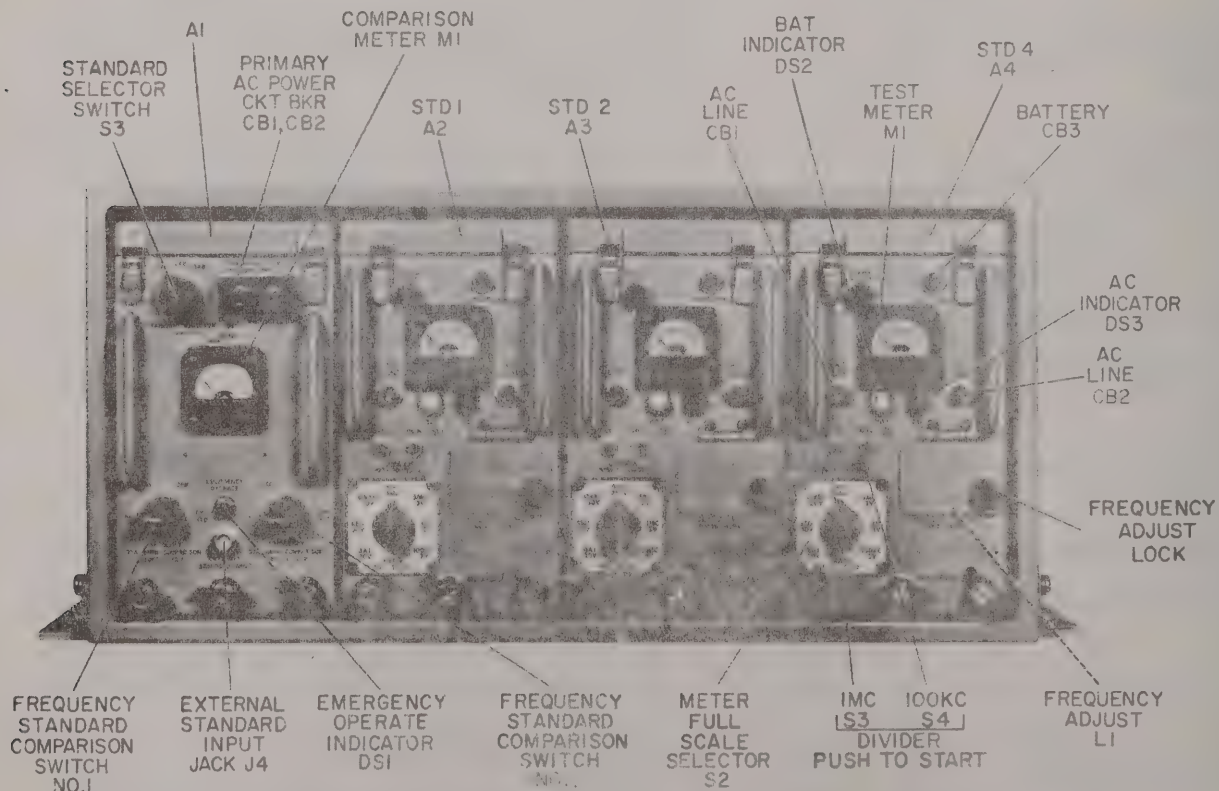


Figure 3-11. Frequency Standard Group OA-4792/SRC-23(V), Controls and Indicators



TABLE 3-3. RADIO TEST SET-MONITOR TS-2476/SRC-23(V),  
CONTROLS AND INDICATORS (figure 3-12)

CONTROL OR INDICATOR	REFERENCE DESIGNATION	FUNCTION
FUNCTION select	S1	Seven-position rotary switch.
SELF-TEST		Applies F1 and F2 tones to internal distortion analyzer circuits for self-test purposes.
DISTORTION-LSB		Applies tone outputs to LSB channel. Received LSB audio is applied to distortion analyzer.
DISTORTION-USB		Applies tone outputs to USB channel. Received USB audio is applied to distortion analyzer.
LEVEL CHECK-USB		Applies tones to USB channel for system level checks.
LEVEL CHECK-BOTH		Applies tones to both USB and LSB channels for system level checks.
LEVEL CHECK-LSB		Applies tones to LSB channel for system level checks.
FSK	S2	Applies received fsk tones to internal oscilloscope for fsk performance test purposes.
TONE SELECT switch		
(F1) 1275		Selects 1275-cps F1 tone output.
BOTH		Selects 1275-cps F1 tone and 1550-cps F2 tone outputs.
(F2) 1550	S3	Selects 1550-cps F2 tone output.
FILTER SELECT switch		Selects distortion analyzer filter circuit as follows:  F1-1275 cps F2-1550 cps F1 & F2-2825 cps 2F1-F2-1000 cps 2F2-F1-1825 cps 2F1-2550 cps 400-400 cps 800-800 cps
KEY switch		Key radio transmitters for all system tests.
LEVEL MEASUREMENTS attenuators		Control distortion analyzer audio input. AT10 provides 40-db attenuation in 10-db steps. AT11 provides 10-db attenuation in 1-db steps.
XMIT TONE ATTENUATORS		Control audio output of tone generating circuits. AT12 provides 100-db attenuation in 10-db steps. AT13 provides 10 db attenuation in 1-db steps.
F1 TONE LEVEL control		Controls F1 tone level.
	R1	

TABLE 3-3. (Continued)

CONTROL OR INDICATOR	REFERENCE DESIGNATION	FUNCTION
F2 TONE LEVEL control	R2	Controls F2 tone level.
RECEIVE AUDIO LEVEL	R23	Controls audio input level to VU meter.
VU meter	M1	Indicates level of each two-tone audio component below the level of a single tone (in conjunction with LEVEL MEASUREMENT attenuators).
Cathode ray tube oscilloscope	V1	Provides visual display of waveforms applied to vertical and horizontal inputs.
FOCUS control	R24	Focuses cathode ray tube electron beam to provide sharp, clear pattern.
VERT POS control	R25	Adjusts vertical position of oscilloscope pattern.
VERT GAIN control	R26	Adjusts gain of vertical amplifier.
INTENSITY control	R27	Adjusts brightness of oscilloscope pattern.
HORIZ POS control	R28	Adjusts horizontal position of oscilloscope pattern.
HORIZ GAIN control	R29	Adjusts gain of horizontal amplifier.
POWER ON-OFF circuit breaker	CB1	Applies 115-volt, 400-cps, single-phase power to radio test set monitor. Protects source against power.

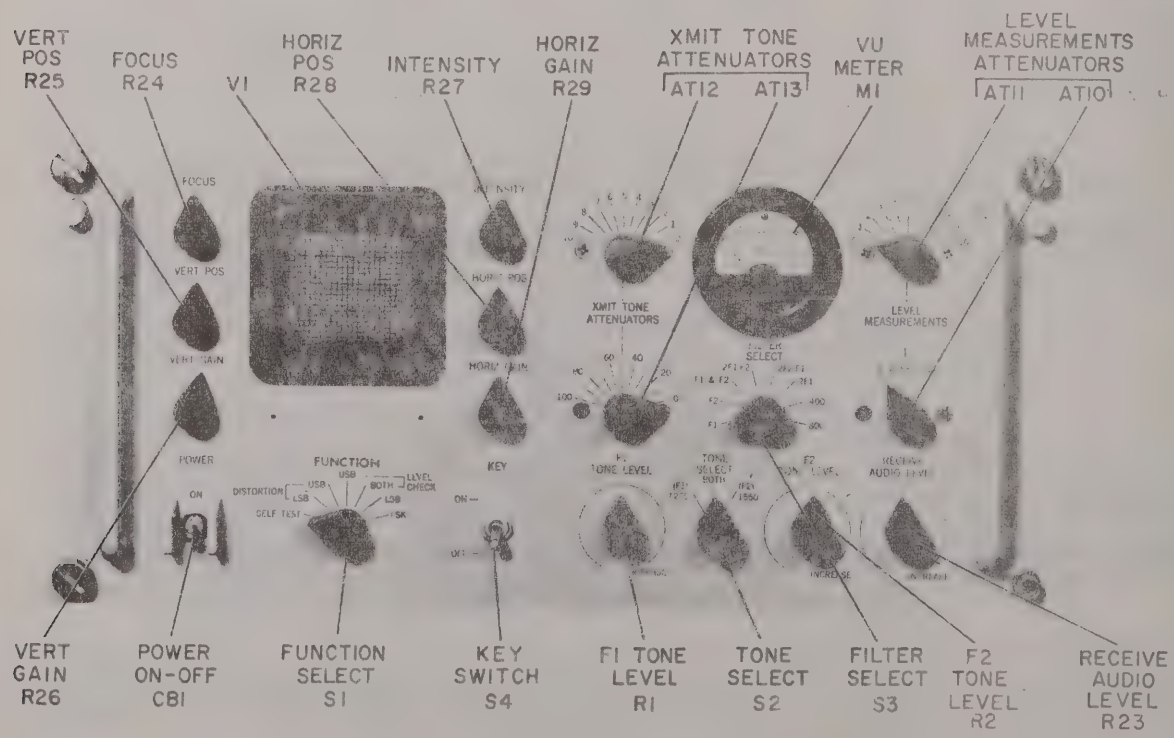


Figure 3-12. Radio Test Set-Monitor TS-2476/SRC-23(V), Controls and Indicators

TABLE 3-4. ANTENNA COUPLER CONTROL LINE SIMULATOR,  
CONTROLS AND INDICATORS (figure 3-13)

CONTROL OR INDICATOR	REFERENCE DESIGNATION	FUNCTION
CARRIER ON/ CARRIER OFF/ OPERATE switch	S1	Three-position toggle switch. Requests carrier insert in CARRIER ON position, signifies tune complete in OPERATE position.
ALARM switch	S2	Two-position toggle switch. OFF position simulates operational antenna coupler control input.
LOAD SELECTED indicator	DS1	Lights when associated transmitter is in OPERATE condition.

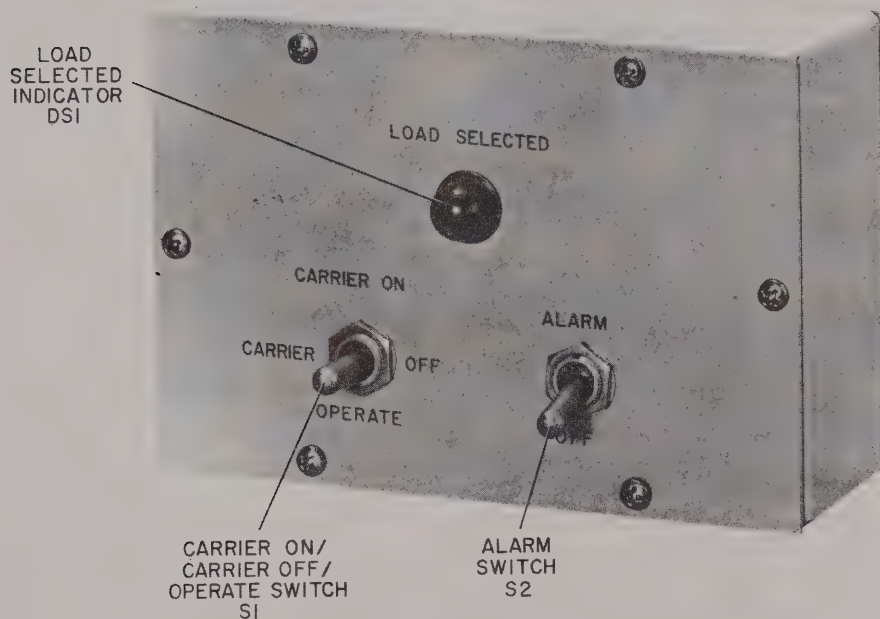


Figure 3-13. Antenna Coupler Control Line Indicator, Controls and Indicators



3-3. RECEIVER-TRANSMITTER GROUP OA-8012/  
SRC-23(V) OPERATING PROCEDURES.

CAUTION

During operation, be sure cooling water is supplied to the cabinet. The cooling water temperature should not exceed 95 degrees Fahrenheit.

a. STARTING EQUIPMENT. - Normally, primary power is applied to the receiver-transmitter group. If the equipment has been secured for any reason, apply primary power as follows:

(1) Set the electrical equipment cabinet POWER ON-OFF circuit breaker to ON. The ELAPSED TIME indicator should start to operate. Also the blower motor in the bottom of the electrical equipment cabinet should be heard in operation.

Note

When the receiver-transmitter group includes optional frequency standard unit A4, be sure that the AC power indicator is lighted at all times. If ac power supplied to the electrical equipment cabinet is interrupted, the BAT indicator should remain lighted. The frequency standard will operate for two hours on internal batteries.

(2) Set the receiver control mode select switch to DATA and the USB/ISB/LSB switch to ISB. Set the PWR ON-OFF circuit breaker to ON. The RCVR alarm, STANDBY, and SIMPLEX indicators should light, all other receiver control indicators should be off, and the XMTR CONT alarm indicator on the transmitter control should light.

(3) Set the transmitter control mode select switch to DATA and the USB/ISB/LSB switch to ISB. Set the PWR ON-OFF circuit breaker to ON. The XMTR CONT alarm indicator should go off. The XMTR, RF AMPL, and ANT. CPL alarm indicators should light. The STANDBY indicator should light.

Note

Corresponding indicators on the remote transmitter control and remote receiver control should light also.

(4) Set the radio receiver PRIMARY POWER AC CIRCUIT BREAKERS to ON. The receiver control RCVR alarm indicator should go off.

(5) Set the radio transmitter PRIMARY POWER AC CIRCUIT BREAKERS to ON. The transmitter control XMTR alarm indicator should go off.

(6) Set the rf amplifier CONT CKTS and PRI POWER CIRCUIT BREAKERS to ON. The transmitter control RF AMPL alarm indicator should go off.

(7) Set the POWER ON circuit breakers on the associated antenna couplers to ON. The transmitter control ANT. CPLR alarm indicator should go off.

(8) When optional equipment is in use with the receiver-transmitter group, refer to the applicable technical manuals for starting and operating procedure.

b. OPERATING PROCEDURES. - Most receiver-transmitter group installations are intended for remote-controlled operation. Transmitter Control-Indicator C-6704/SRC-23(V) and Receiver Control-Indicator C-6705/SRC-23(V) are provided for this purpose. To enable these remote controls, set the local transmitter and receiver control mode select switches to the REMOTE position. The CONTROL indicators on the remote transmitter and receiver controls will light, indicating the receiver-transmitter group is ready for remote-controlled operation. The following operating procedures describe remote-controlled operation. However, with the exception of local mode select switch settings, the procedures also apply to local-controlled operation.

(1) MODE SELECTION.

(a) CW OPERATION. - Set the mode select switches to CW. In the CW mode, an af-CW oscillator is keyed when the CW key is pressed. The af-CW oscillator produces a 1000-cps tone which is applied to the radio transmitter USB audio input. The transmitter is keyed when the CW key is pressed. Received USB audio signals bypass the USB squelch network. No LSB audio output is available.

(b) FSK OPERATION. - Set the mode select switches to FSK. The receiver-transmitter is capable of accepting binary teletypewriter loop current (0-ma space and 60-ma mark) signals or external fsk audio input signals. Normally, a 0-ma space input is converted to a 1575-cps tone, and a 60-ma mark input is converted to a 2425-cps tone. The mark and space tones can be inverted by setting an internal transmitter control FSK POLARITY switch from NORM to INV. Transmitter keying in the fsk mode depends upon the type of teletypewriter and fsk terminal equipment which is supplied. Usually, the radio transmitter is keyed when the keyboard send-receive switch is set to send. The transmit fsk tones are applied to the radio transmitter USB audio input.

(c) DATA OPERATION. - Set the mode select switches to DATA. Use the USB/ISB/LSB switch associated with the DATA mode select position to select USB, LSB, or ISB (both USB and LSB) operation. Each sideband provides a 3-kc bandwidth. Separate data messages can be transmitted and received on each sideband in the ISB mode or the same data message can be transmitted on each sideband to provide frequency diversity. The radio transmitter is automatically keyed by the associated data equipment. Both the USB and LSB squelch networks

are bypassed by received data messages. Also, the rf-bfo oscillator is disabled in the data mode.

(d) **VOICE OPERATION.** - Set the mode select switches to VOICE. Use the USB/ISB/LSB switch to select USB, ISB, or LSB operation. Set the SQUELCH switches to ON, and set the RCVR GAIN switch to MAX, NORM or LOCAL, depending on the received signal strength. In the voice mode, the radio transmitter is keyed when the remote handset or voice control push-to-talk switch is pressed.

(e) **AM OPERATION.** - Set the mode select switches to AM for compatible AM operation. In the AM mode of operation, transmitted audio is applied to the radio transmitter USB audio input. AM messages are transmitted as USB plus carrier. Received AM messages are detected by an if.-AM amplifier assembly in the local receiver control. The resultant audio signal is applied to the USB audio output.

(2) **SIMPLEX TUNING PROCEDURE.** - In the simplex mode of operation, the receiver and transmitter share the same antenna and associated antenna coupler rf circuit. Messages can be transmitted or received, but not simultaneously. The receiver-transmitter group remains in the receive condition until the transmitter is keyed. Received signals are interrupted until the transmitter key is released. Then the receiver-transmitter group automatically reverts to the receive condition.

(a) Select the receiver-transmitter group mode of operation, as described in paragraph 3-3b(1).

(b) Press the 1KW/5KW pushbutton to select either the 1-kw rf amplifier or the optional 5-kw rf amplifier.

(c) Press the SIMPLEX/DUPLEX pushbutton on the receiver control to light the SIMPLEX portion of the indicator.

(d) Set the FREQUENCY-MEGACYCLES selectors on both frequency selector controls to the required operating frequency.

#### Note

The ANT. CPLR alarm indicators will light if no antenna coupler is available for the selected frequency or if the transmitter frequency is selected above 5.9999 mc and the optional 5-kw rf amplifier has been selected.

#### CAUTION

The operating frequency must be selected at least 15 percent away from the receive and transmit frequency of any other channel. Refer to figure 3-14 to determine 15-percent channel spacing.

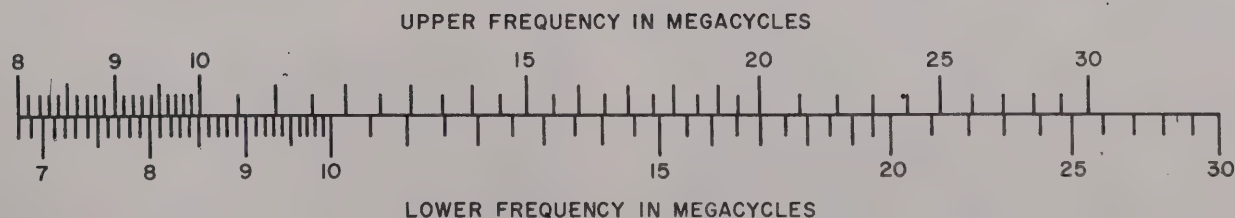
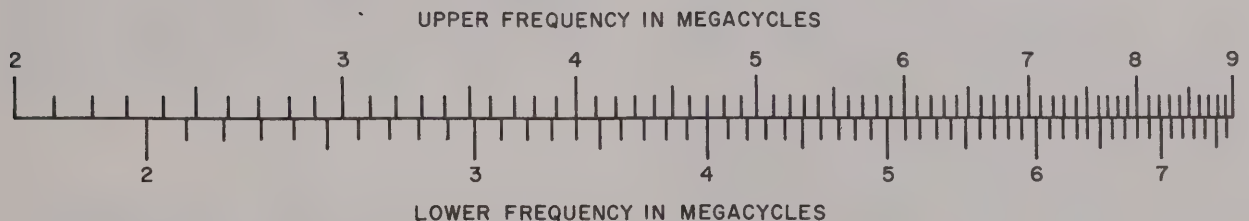


Figure 3-14. Chart for Determining 15-Percent Channel Spacing

(e) Press the transmitter control and receiver control TUNE/OPERATE pushbuttons in succession. Either pushbutton can be pressed first. However, because the transmitter and receiver frequency selector controls share the frequency select control lines, both the receiver and transmitter cannot be tuned simultaneously. Wait until the first unit (transmitter or receiver) has completed tuning before pressing the opposite TUNE/OPERATE pushbutton.

Note

To prevent rf transmission during tuning, press the transmitter control RADIO SILENCE TUNE pushbutton instead of the TUNE/OPERATE pushbutton. The associated antenna coupler will then be tuned into a 50-ohm resistive dummy load instead of the antenna. The RADIO SILENCE TUNE indicator will light concurrently with the TUNE indicator.

Upon completion of transmitter and receiver tuning, the OPERATE portions of each indicator should light.

When the receiver control OPERATE indicator lights, the receiver is ready for operation. When the transmitter control OPERATE indicator lights, the radio transmitter must be automatically or manually keyed to transmit. In the data mode of operation, the associated data equipment automatically keys the transmitter. In other modes of operation, manual keying is required. In the simplex mode of operation, a receiver overload protector circuit protects the radio receiver against excessive rf signals.

(3) DUPLEX TUNING PROCEDURE. - In the duplex mode of operation, the receiver and transmitter are capable of simultaneous operation. The receiver and transmitter may operate with the same antenna but require separate antenna couplers and must be tuned to frequencies which are at least 15 percent apart. The transmitter is used to tune the receiver antenna coupler before the antenna is transferred to the receiver rf input. Then, the transmitter and its separate antenna coupler are tuned to the transmitter frequency. Therefore, the duplex tuning procedure differs from the simplex tuning procedure described in paragraph (2).

(a) Select the receiver-transmitter group mode of operation as described in paragraph 3-3b(1).

(b) Press the 1KW/5KW pushbutton to select the 1-kw rf amplifier or the optional 5-kw rf amplifier.

(c) Press the SIMPLEX/DUPLEX pushbutton on the receiver control to light the DUPLEX portion of the indicator.

(d) Set the FREQUENCY-MEGACYCLES selectors on both frequency selector controls to the required operating frequency.

Note

The ANT. CPLR alarm indicators will light if no antenna coupler is available or if the 5-kw rf amplifier has been selected and the selected frequency is above 5.999 mc.

CAUTION

The receiver operating frequency must be at least 15 percent away from the transmitter or receiver frequency of any other channel. Refer to figure 3-14 to determine 15-percent channel spacing.

(e) Press the transmitter control RADIO SILENCE TUNE pushbutton and the receiver control TUNE/OPERATE pushbutton in succession. The pushbuttons may be pressed in either order. The RADIO SILENCE TUNE indicator will light to indicate when the transmitter is tuning. The TUNE portion of the TUNE/OPERATE indicator will light to indicate when the receiver is tuning. Wait until the first unit (receiver or transmitter) has completed tuning before pressing the opposite pushbutton. During radio silence tuning, the selected antenna coupler will tune into a 50-ohm rf dummy load instead of the antenna of the ship.

(f) When the antenna coupler intended for use with the receiver has completed fine tuning, the OPERATE portion of the receiver control TUNE/OPERATE indicator will light, and the TUNE portion will go out. Also, the OPERATE portion of the transmitter control TUNE/OPERATE indicator will light, and the RADIO SILENCE TUNE indicator will go out.

Note

At this point, the antenna coupler must be switched from the transmitter rf output to the receiver rf input, either by means of an rf switching matrix or an rf patch panel. At specific installation where Radio Set AN/SRC-23(V) is used with Antenna Coupler Group OA-4794/SRA-34(V), the rf transmission line transfer must be accomplished within 30 seconds, or the associated CU-1169/SRC-16 will revert to the standby condition.

(g) After the receiver antenna coupler has been fine tuned and switched to the receiver rf input, connect the transmitter to its associated antenna coupler, either by means of an rf switching matrix or an rf patch panel.

(h) Set the FREQUENCY-MEGACYCLES selectors on the transmitter frequency selector control to the required transmitter frequency. Make sure the transmitter frequency is selected at



least 15 percent away from the receiver frequency or any other channel.

#### Note

If the transmitter control ANT. CPLR alarm indicator lights, it may be that the antenna coupler selected for the receiver was the last available antenna coupler which covers the selected operating frequency. If this is so, the transmitter operating frequency may be shifted to within the range of another antenna coupler. Also, if a manually tuned antenna coupler is to be used, an Antenna Coupler Control Line Simulator is required. Refer to paragraph 3-6c for tuning procedure with optional Antenna Coupler Control Line Simulator.

(i) Press the transmitter control TUNE/OPERATE pushbutton. The TUNE portion of the indicator should light. After tuning is complete, the TUNE indicator should go off and the OPERATE indicator should light.

(j) When the OPERATE indicator lights, the radio transmitter must be automatically or manually keyed to transmit.

(k) At some installations, optional Bandpass Filter F-1039/U may be provided. The purpose of the bandpass filter is to protect the associated radio receiver during duplex operation. If an rf overload occurs, the bandpass filter disconnects the radio receiver rf input from the antenna and provides a RCVR OVLD alarm indication at the receiver control.

#### Note

Bandpass Filter F-1039/U protects the radio receiver against rf voltages up to 1400 volts peak at frequencies 10 percent or more off the duplex radio receiver frequency.

(l) If the RCVR OVLD alarm indicator lights when the radio transmitter is keyed, it may be necessary to select a radio transmitter operating frequency further from the duplex radio receiver frequency.

(4) OPERATIONAL GAIN CONTROL. - The receiver-transmitter group includes automatic gain control circuits which provide optimum receiver and transmitter gain under normal operating conditions. Manual gain controls are provided on both the receiver and transmitter controls to control the receiver and transmitter gain under other than normal conditions.

(a) XMTR GAIN. - The XMTR GAIN control is a potentiometer which can be rotated from MIN to MAX. For normal operation, set the XMTR GAIN control fully clockwise to the MAX position.

The alc (automatic load control) circuit will maintain the rf output power at 1 kilowatt, without overdriving during signal peaks. Use the af-rf monitor to check rf power.

When transmitting to nearby ships or shore based installations, rotate the XMTR GAIN control counter-clockwise to reduce the rf output power level and prevent overloading the nearby radio receiver. At the MIN position, the rf output power should be reduced to approximately 5 watts.

(b) RCVR GAIN. - The RCVR GAIN control is a 3-position toggle switch. Under normal operating conditions, set the RCVR GAIN control to the NORM position. The radio receiver agc (automatic gain control) circuits are adjusted to provide 0-dbm audio output levels. Check receive audio output levels on the af-rf monitor AUDIO meter.

To improve reception of weak rf signals, set the RCVR GAIN control to MAX. With the RCVR GAIN switch in the MAX position, the radio receiver rf amplifier stages are biased for maximum rf gain.

The LOCAL position of the RCVR GAIN control is used to protect the radio receiver from being overloaded by a nearby radio transmitter. When the RCVR GAIN control is set to LOCAL in the simplex mode of operation, an rf attenuator in the local receiver control provides 40 db attenuation. When the RCVR GAIN control is set to LOCAL in the duplex mode of operation, the optional bandpass filter low-gain circuit provides approximately 35 db attenuation.

c. LOCAL OPERATION. - Local and remote controls are provided for the receiver-transmitter group. The local controls are located on Transmitter Control C-4784A/SRC-23(V), unit A2, Receiver Control C-4784A/SRC-23(V), unit A3, and Frequency Selector Controls C-4783/SRC-23(V), units A8 and A9. The controls and indicators located on these units enable complete local-controlled operation of the receiver-transmitter group. However, most installations are intended for remote-controlled operation and include Transmitter Control-Indicator C-6704/SRC-23(V) and Receiver Control-Indicator C-6705/SRC-23(V). The local controls function as back-up controls which can be used also for maintenance test purposes. Because corresponding controls on associated local and remote control units are identical, and operating procedures are similar, the procedures described for remote-controlled operation also apply to local operation. Therefore, only local control functions which are not available at the remote control units are described in this paragraph. These functions include the local handset and doppler test modes of operation.

#### (1) LOCAL HANDSET OPERATION.

(a) Connect Handset H-169, or an equivalent handset, to the transmitter control LOCAL HANDSET connector jack.

(b) Set the transmitter control mode select switch to LOCAL HANDSET.

(c) Set the transmitter control USB/AM/LSB switch to select USB, LSB or AM operation. When USB or LSB is selected, the transmit audio input to the opposite sideband is disconnected and

terminated. When AM is selected, the transmitted audio is applied to the USB input only, and a USB plus carrier signal is transmitted.

(d) Set the receiver control mode select switch to VOICE, and set the USB/ISB/LSB switch to ISB to receive either USB or LSB messages. Set the mode select switch to AM to receive AM signals.

(e) Set the receiver control SQUELCH switches to ON.

(f) If the receiver audio pitch sounds abnormally high or low, set the receiver control FINE TUNE-CPS ON-OFF switch to ON. Use the FINE TUNE-CPS adjust to improve the audio output.

(g) To transmit, press the push-to-talk switch on the local handset.

(2) DOPPLER TEST OPERATION. - The doppler test mode of operation is available for use with external data equipment which is capable of correcting for doppler shift. When the receiver control mode select switch is set to DOPPLER TEST, the receiver-transmitter automatically reverts to

simplex operation, the USB and LSB squelch networks are automatically bypassed, and the FINE TUNE-CPS adjust can be used to vary the 500-kc injection signal to the radio receiver. The 500-kc reference permits the associated data equipment doppler correction circuits to be checked by varying the data tone frequency.

d. SECURING THE EQUIPMENT.

(1) STANDBY. - If the receiver-transmitter group is not required for an extended period of time, press the receiver and transmitter, control, STANDBY pushbuttons. In the standby condition, power is applied to the receiver-transmitter group control circuits and tube filaments. The equipment can be returned to the operate condition immediately by pressing the TUNE/OPERATE pushbutton.

(2) SHUT DOWN. - Set the circuit breakers on the individual receiver-transmitter units to OFF.

3-4. SUMMARY OF OPERATING PROCEDURES.

Table 3-5 is a summary of operating procedures.

TABLE 3-5. SUMMARY OF OPERATING PROCEDURES

UNIT	CONTROL	SETTING OR PROCEDURE
STARTING THE EQUIPMENT		
Electrical equipment cabinet	POWER ON-OFF	ON.
Local receiver control	PWR ON-OFF	ON.
Local transmitter control	PWR-ON-OFF	
Radio receiver	PRIMARY POWER AC CIRCUIT BREAKERS	ON.
Radio transmitter	PRIMARY POWER AC CIRCUIT BREAKERS	ON.
Rf amplifier	CONT CKTS and PRI POWER CIRCUIT BREAKERS	ON.
Associated antenna couplers	POWER ON	ON.
Optional 5-kw rf amplifier	MAIN DISCONNECT	ON.
REMOTE-CONTROLLED OPERATION		
Local receiver control	Mode select	REMOTE.
Local transmitter control	Mode select	REMOTE.
Remote receiver control	Mode select	CW, FSK, DATA, VOICE, or AM.
	USB, ISB/LSB	USB, ISB, or LSB (on VOICE or DATA only).

TABLE 3-5. (Continued)

UNIT	CONTROL	SETTING OR PROCEDURE
REMOTE-CONTROLLED OPERATION (Cont)		
Remote transmitter control	SQUELCH LSB	ON.
	SQUELCH USB	ON.
	FINE TUNE CPS	ON, set to 0 midpoint.
	RCVR GAIN	NORM.
	Mode select	CW, FSK, DATA, VOICE, or AM (same as receiver control mode select).
	USB/ISB/LSB	USB, ISB, or LSB on VOICE or DATA only (same as receiver control).
	XMTR GAIN	MAX.
Remote transmitter control	1KW/5KW	Press to select 1-kw rf amplifier unit A7 (1 KW) or optional 5-kw rf amplifier (5 KW).
SIMPLEX REMOTE TUNING PROCEDURE		
Remote receiver and transmitter controls	Mode select	Set to select mode of operation.
Remote transmitter control	1KW/5 KW	Press to select rf amplifier.
Remote receiver control	SIMPLEX/DUPLEX	Press to select SIMPLEX.
Remote receiver and transmitter frequency selector controls	FREQUENCY-MEGACYCLES	Set within 2.0000- to 29.9999-mc range.
Remote receiver control	TUNE/OPERATE	Press to light TUNE indicator.
Remote transmitter control	TUNE/OPERATE or RADIO SILENCE TUNE	Press to light TUNE indicator.  Wait for OPERATE indicator to light.
DUPLEX REMOTE TUNING PROCEDURE		
Remote receiver and transmitter controls	Mode select	Set to select mode of operation.
Remote transmitter control	1KW/5KW	Press to select rf amplifier.
Remote receiver control	SIMPLEX/DUPLEX	Press to select DUPLEX.



TABLE 3-5. (Continued)

UNIT	CONTROL	SETTING OR PROCEDURE
DUPLIX REMOTE TUNING PROCEDURE (Cont)		
Remote receiver and trans- mitter frequency selector controls	FREQUENCY-MEGACYCLES	Set within 2.0000- to 29.9999- mc range to selected receiver frequency.
Remote receiver control	TUNE/OPERATE	Press to light TUNE indicator.
Remote transmitter control	RADIO SILENCE TUNE	Press to light RADIO SILENCE TUNE indicator. Wait for transmitter control and receiver control OPERATE indicators to light.
		Transfer receiver antenna coupler from transmitter rf output to receiver rf input. Transfer must be completed within 30 seconds.
Remote transmitter frequency selector control	FREQUENCY-MEGACYCLES	Set to transmitter frequency required for duplex operation.
Remote transmitter control	TUNE/OPERATE	Press to light TUNE indicator.
		Wait for OPERATE indicator to light.
OPERATIONAL GAIN CONTROL		
Remote transmitter control	XMTR GAIN	Rotate counterclockwise to re- duce rf output power.
Remote receiver control	RCVR GAIN	Set to MAX for reception of weak rf signals.
		Set to LOCAL for reception of strong rf signals.
LOCAL CONTROLLED OPERATION		
Local receiver control	Mode select	Set to desired mode of operation CW, FSK, DATA, VOICE, AM or DOPPLER TEST.
Local transmitter control	Mode select	Set to desired mode of operation. CW, FSK, DATA, VOICE, AM or LOCAL HANDSET.
<p>Note</p> <p>For CW, FSK, DATA, VOICE and AM operation, refer to summary of remote-controlled operating procedure. Use the identically marked controls and indicators on the local receiver and transmitter frequency selector controls.</p>		

TABLE 3-5. (Continued)

UNIT	CONTROL	SETTING OR PROCEDURE
LOCAL HANDSET OPERATION		
Local transmitter control	Mode select	Set to LOCAL HANDSET. Connect H-169 to LOCAL HANDSET front panel connector.
Local receiver control	USB/AM/LSB	USB, AM, or LSB.
	Mode select	VOICE.
	USB/ISB/LSB	ISB.
	SQUELCH LSB	ON.
	SQUELCH USB	ON.
Local handset	FINE TUNE CPS	ON. Tune for best quality audio output.
	Push-to-talk	Press to transmit.
STANDBY OPERATION		
Local or remote receiver and transmitter controls	STANDBY	Press to light STANDBY indicator.
SECURING THE EQUIPMENT		
Set all individual unit circuit breakers to OFF except for the electrical equipment cabinet POWER ON-OFF circuit breaker.		
CAUTION		
Do not set electrical equipment cabinet POWER ON-OFF circuit breaker to OFF if frequency standard unit A4 is installed in cabinet.		

**3-5. EMERGENCY OPERATION.** - The receiver-transmitter group units are equipped with thermal overload protection circuits which are intended to prevent operation in the event a thermal overload occurs. A temperature alarm circuit in the electrical equipment cabinet operates if the internal temperature exceeds +57°C (+135°F). When the temperature alarm operates, it lights the TEMP ALARMS - WARNING indicator and sounds the warning horn at the top of the electrical equipment cabinet. The warning horn can be shut off by pressing the WARNING/UNSAFE-HORN CANCEL pushbutton. However, the WARNING portion of the pushbutton indicator remains lighted for the duration of the internal temperature alarm.

Radio receiver unit A5, radio transmitter unit A6, and rf amplifier unit A7 contain individual thermal

overload protection circuits. If the internal temperature within any of these units exceeds 68°C (154°F), the internal thermal overload protection circuit disables the unit. The circuit also lights the UNSAFE portion of the WARNING/UNSAFE pushbutton indicator on the electrical equipment cabinet front panel.

During an emergency, press the BATTLE SHORT pushbutton to operate the receiver-transmitter group even though unsafe operating conditions exist.

### 3-6. OPERATOR'S MAINTENANCE.

**a. FREQUENCY STANDARD CHECKS AND ADJUSTMENTS.** - The operating frequency of the receiver-transmitter group is stabilized by a 100-kc frequency standard. At some installations, frequency

standard unit A4 is provided as part of the receiver-transmitter group. Some shore-based installations operate with an external source of 100 kc when a high stability source is available. At installations which include two or more receiver-transmitter groups, a signal comparator is used to compare the output of the frequency standards in the system and to select one of them as the primary frequency standard for the system. Frequency Standard Group OA-4792/SRC-23(V) contains three frequency standards and a signal comparator located in a single case. The following paragraphs describe how to compare frequency standard 100-kc outputs with the signal comparator.

Note

Battery charging voltage adjustment, coarse frequency adjustment, and crystal aging calibration procedures for the frequency standard are described in chapter L of this technical manual.

(1) PRELIMINARY STEPS.

(a) Check the signal comparator EMER OPR indicator. If the indicator is lighted, one of the rf isolation amplifier assemblies is faulty. Notify maintenance personnel.

(b) Check the frequency standard AC and BAT indicators. If the AC indicator is not lighted, notify maintenance personnel.

(c) On each frequency standard, set the front panel test selector to 100 KC. The test meter should indicate at least 1 volt. If no indication is observed, press the 1 MC DIVIDER PUSH TO START and 100 KC DIVIDER PUSH TO START. If a normal indication is not observed, notify maintenance personnel.

(2) SIGNAL COMPARISON. - At least one of the available frequency standards should be calibrated against an external frequency standard having a frequency stability of better than 1 part in  $10^9$ . Frequency adjustment and crystal aging calibration procedure are described in chapter L. Performance of these procedures is the responsibility of maintenance personnel. When one of the available frequency standards has been established as a primary frequency standard using these procedures, the remaining frequency standards can be compared with the primary frequency standard.

The following steps describe how to compare the system frequency standards. The procedures are based on the assumption that the frequency standard designated STD 1 is a primary frequency standard. If the frequency standard designated STD 2 or STD 3 is the primary frequency standard, modify the procedures accordingly.

(a) Set signal comparator FREQUENCY STANDARD COMPARISON SWITCH NO. 1 to STD 1.

(b) Set signal comparator FREQUENCY STANDARD COMPARISON SWITCH NO. 2 to STD 2.

(c) Count the number of cycles completed by the signal comparator meter within a 100-second period. One cycle is completed each time the meter needle swings past the reference mark in the same direction.

(d) Each cycle completed within the 100-second period represents a frequency difference of 1 part in  $10^9$ . If the frequency difference is more than 5 parts in  $10^9$ , STD 2 should be adjusted to STD 1.

(e) Loosen the lock on STD 2, and adjust FREQUENCY ADJUST - PARTS IN  $10^{10}$  until the signal comparator meter needle stops moving. If sufficient adjustment is not available, refer to chapter L, section 5. After completing adjustment, tighten the lock.

(f) Set signal comparator FREQUENCY STANDARD COMPARISON SWITCH NO. 2 to STD 3.

(g) Repeat steps (c) thru (d) and step (e) if required.

b. RADIO TEST SET - MONITOR OPERATION AND PROCEDURES. - The radio test set-monitor is used to analyze the receiver-transmitter group audio frequency distortion, perform system level checks, test receiver-transmitter frequency lock, and check fsk performance.

(1) TEST SETUP. - At single receiver-transmitter group installations, the radio test set-monitor audio outputs and inputs are directly connected to corresponding receiver-transmitter group audio inputs and outputs. At installations which include two or more receiver-transmitter groups, the radio test set-monitor is connected to the receiver-transmitter group to be tested by means of patch panels. In general, patch the radio test set-monitor LSB and USB audio outputs to the transmit LSB and USB audio inputs respectively. Patch the receiver LSB and USB audio output to the radio test set-monitor LSB and USB audio inputs respectively. Specific test set-up interconnection data depends upon individual installations.

(2) SELF-TEST PROCEDURE. - Before the distortion of the receiver-transmitter group LSB and USB channels can be analyzed, the distortion of the radio test set-monitor tone generating circuits must be determined. This is accomplished by using the self-test function. Proceed as follows:

(a) Set XMIT TONE ATTENUATORS and LEVEL MEASUREMENTS attenuators to 0.

(b) Set FUNCTION selector to SELF TEST.

(c) Set TONE SELECT switch to (F1) 1275 and FILTER SELECT switch to F1.

(d) Adjust F1 TONE LEVEL and RECEIVE AUDIO LEVEL controls to obtain 0-vu meter indication.

(e) Set TONE SELECT switch to (F2) 1550 and FILTER SELECT switch to F2.

(f) Adjust F2 TONE LEVEL control to 0-vu meter indication. Do not disturb the RECEIVE AUDIO LEVEL control setting of step (d).

(g) Set TONE SELECT switch to BOTH, and turn LEVEL MEASUREMENTS attenuators to 10 and 40 (maximum clockwise positions).



(h) Set FILTER SELECT switch to F1 & F2, 2F1-F2, 2F2-F1, 2F1, 400 and 800. At each switch setting, the VU meter indication should be -20 vu or less.

(3) DISTORTION TEST PROCEDURE. - Always perform the self-test procedure described in paragraph 3-6b(2) before attempting receiver-transmitter group distortion tests.

(a) Place the receiver-transmitter group in simplex 1-kw operation at the specified test frequency. Set the applicable mode select switches to VOICE, and set the USB/ISB/LSB switches to ISB. Wait for the OPERATE indications to light.

(b) Set the radio test set-monitor FUNCTION selector to DISTORTION LSB or USB depending upon which sideband is to be analyzed. Set KEY switch to ON.

(c) Set the XMIT TONE ATTENUATORS and LEVEL MEASUREMENTS attenuators to 0.

(d) Set TONE SELECT switch to (F1) 1275 and FILTER SELECT switch to F1.

(e) Adjust F1 TONE LEVEL control to provide 100 watts as indicated on the af-rf monitor RF meter.

(f) Adjust the RECEIVE AUDIO LEVEL control to obtain a 0-vu meter indication on the radio test set-monitor VU meter.

(g) Set the TONE SELECT switch to (F2) 1550 and FILTER SELECT switch to F2.

(h) Adjust the F2 TONE LEVEL control to provide 100 watts rf output power as indicated on the af-rf monitor RF meter. Do not disturb the RECEIVE AUDIO LEVEL control setting made in step (f).

(i) Set TONE SELECT switch to BOTH.

(j) Adjust the RECEIVE AUDIO LEVEL control to obtain a 0-vu meter indication with the FILTER SELECT switch in either the F1 or F2 position.

(k) Set FILTER SELECT switch to F1 & F2, and adjust LEVEL MEASUREMENTS attenuators to obtain a nearly 0-vu meter indication. Record the level of the F1 & F2 audio component below the level of a single tone. Use the combined indication presented by the VU meter and the LEVEL MEASUREMENTS attenuators.

#### Note

Algebraically subtract the VU meter indication from the LEVEL MEASUREMENTS attenuators indications. For example, if the LEVEL MEASUREMENTS attenuators are set to 40 and 10, respectively, and the VU meter indicates -7 vu, then the audio component is 57 db below the level of the single tone. If the VU meter should indicate +1 vu under these conditions, then the audio component is 49 db below the level of the single tone.

(l) Set FILTER SELECT switch to the remaining positions, 2F1-F2, 2F2-F1, 2F1, 400 and 800. At each position, repeat the measurement procedure of step (k) to obtain the level of each audio component below the level of a single tone.

#### (4) SYSTEM LEVEL CHECK PROCEDURE.

(a) Place the receiver-transmitter group in simplex 1-kw operation at the specified test frequency.

(b) Set the applicable mode select switches to DATA, and set the USB/ISB/LSB switch to USB.

(c) Set the radio test set-monitor FUNCTION selector to LEVEL CHECK-USB.

(d) Set XMIT TONE ATTENUATORS to 0. Set TONE SELECT switch to (F1) 1275, and adjust F1 TONE LEVEL control for 0-db indication on af-rf monitor AF meter. If tone level is too high, use the XMIT TONE ATTENUATORS to obtain 0 db.

(e) Set the radio test set-monitor KEY switch to ON.

(f) The RF meter on the af-rf monitor should indicate 100 watts.

(g) Set the USB/ISB/LSB switches to LSB, and set the radio test set-monitor FUNCTION selector to LEVEL CHECK-LSB.

(h) Repeat the system level check on LSB.

#### (5) RECEIVER-TRANSMITTER FREQUENCY LOCK TEST PROCEDURE.

(a) Place the receiver-transmitter group in simplex 1-kw operation at the specified test frequency. Set the applicable mode select switches to DATA, and set the USB/ISB/LSB switches to ISB.

(b) Set the radio test set-monitor XMIT TONE ATTENUATORS to 0.

(c) Set TONE SELECT switch to (F1) 1275.

(d) Set FUNCTION selector to LEVEL CHECK-BOTH, and set the KEY switch to ON.

(e) Adjust F1 TONE LEVEL to obtain a good presentation on the oscilloscope. Adjust the FOCUS and INTENSITY controls as required.

(f) If the selected channel receiver frequency is locked to the transmitter frequency, a nearly stable 1:1 Lissajous pattern will be presented on the oscilloscope. The pattern will appear to rotate slowly because of slight phase differences between the receiver and transmitter.

#### (6) FSK PERFORMANCE TEST.

(a) Place the receiver-transmitter group in simplex 1-kw operation at the specified test frequency. Set the mode select switches to FSK.

(b) Set the radio test set-monitor FUNCTION select switch to FSK, and set the KEY switch to ON.

(c) Use the teletypewriter set associated with the receiver-transmitter group to send a test message.

(d) Adjust the radio test set-monitor FOCUS and INTENSITY controls to provide a clear oscilloscope pattern.



(e) The fsk tones are equally shifted 425 cps above and below 2000 cps. When the fsk circuits are performing properly, the tones are 1575 cps and 2425 cps. Under these conditions, a symmetrical X-pattern is displayed on the oscilloscope, as shown in figure 3-15. If the fsk tones are not equally spaced 425 cps from 2000 cps, the X-pattern loses symmetry. The amplitude and phase of each leg will differ considerably.

c. ANTENNA COUPLER CONTROL LINE SIMULATOR OPERATIONAL PROCEDURES. - The Antenna Coupler Control Line Simulator (commonly referred to as the control line simulator) is shown in figure 3-13. The control line simulator is an optional unit which enables the receiver-transmitter group to be used with manually tuned antenna coupler equipment. The control line simulator also permits the rf amplifier to tune into a 50-ohm dummy load during maintenance and performance tests. The control line simulator simulates the required control inputs which are normally provided by an automatically tuned antenna coupler, such as the CU-1169/SRC-16.

When the rf amplifier is connected to a manually tuned antenna coupler or to a 50-ohm dummy load, use the following tuning procedure:

(1) Set the control line simulator CARRIER ON/CARRIER OFF/OPERATE switch to CARRIER OFF, and set the ALARM switch to OFF.

(2) Select the receiver-transmitter group mode of operation and operating frequency as described in paragraph 3-3b(2). Press the 1 KW/5 KW pushbutton to select the required rf amplifier.

(3) Press the transmitter control TUNE/OPERATE pushbutton to tune the transmitter to the selected operating frequency. Observe that the TUNE portion of the TUNE/OPERATE indicator lights.

(4) Set the control line simulator CARRIER ON/CARRIER OFF/OPERATE switch to CARRIER ON, and allow 30 seconds for the rf amplifier to fine tune to the selected frequency.

(5) Refer to the related technical manual for manually tuned antenna coupler tuning instructions.

(6) Upon completion of antenna coupler tuning, set the control line simulator CARRIER ON/CARRIER OFF/OPERATE switch to OPERATE. The TUNE portion of the transmitter control TUNE/OPERATE indicator will go off, and the OPERATE portion will light. Also, the LOAD SELECTED indicator on the control line simulator will light.

Note

To return the receiver-transmitter group to standby, press the transmitter control STANDBY pushbutton, or set the control line simulator ALARM switch to ALARM.

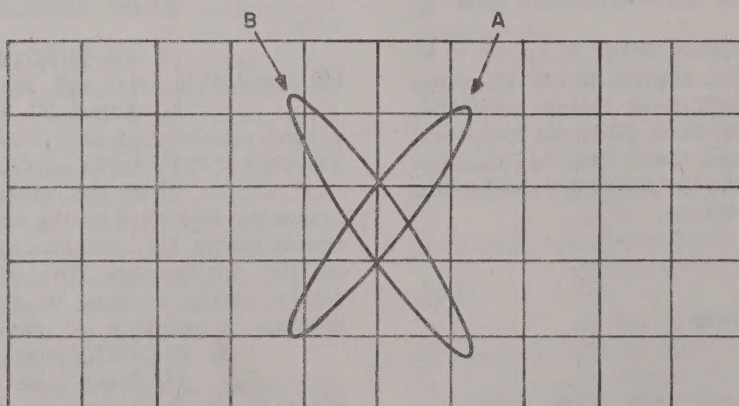


Figure 3-15. FSK Test Patterns







